Appendix F

Scoring Habitat Expansion Actions Using the HEA Criteria

Appendix F

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The Habitat Expansion Agreement (HEA) contains several criteria for identifying, evaluating, recommending, and approving habitat expansion actions. The Steering Committee developed working definitions for the various HEA criteria to facilitate their utilization in selecting actions to be included in the Habitat Expansion Plan (HEP).The Steering Committee also developed a detailed approach for applying the HEA criteria by scoring potential habitat expansion actions based on the working definitions. The various lists of potential habitat expansion actions (found in Appendix B of the Final HEP) were developed based on scores assigned to the actions. Actions with higher scores met the most HEA criteria and were moved forward; actions with lower scores were not considered further. This approach culminated in the recommended actions presented in the Draft HEP and the Final HEP (see Chapter 2 in the Final HEP for more information about developing potential habitat expansion actions).

This appendix (1) identifies the HEA criteria working definitions used by the Steering Committee to consider potential habitat expansion actions (Sections F.1 and F.2); (2) describes the scoring procedure and rationale (Section F.3); and (3) provides the scoring results for the Lower Yuba River Actions and the Upper Yuba River Actions (Section F.4, Table F-1).

F.1 HEA Criteria Working Definitions

The HEA contains several criteria for identifying, evaluating, recommending, and approving habitat expansion actions, including:

- HEA Evaluation Criteria (Section 4.1.1 of the HEA),
- HEA Selection Criteria (Section 4.1.2 of the HEA), and
- NMFS Approval Criteria (Section 4.2.3 of the HEA).

During preparation of the Draft HEP, the Steering Committee developed working definitions for the various HEA criteria (Appendix C1 of the Draft HEP) to facilitate utilization of these criteria for selecting actions to be included in the HEP. Criteria definitions draw on the concepts captured in the HEA, current scientific literature, recovery plans, and other sources. The Steering Committee requested feedback on the working definitions from NMFS, the HEA signatories,

and other stakeholders to further develop these definitions in order to consistently apply the criteria when identifying, evaluating, and recommending habitat expansion actions. Based on comments received during preparation of the Draft HEP, the Steering Committee revised the working definitions and presented them to the HEA signatories and other interested stakeholders at an August 12, 2009 informational meeting.

The *Working Definitions of Evaluation, Selection, and Approval Criteria* are available on the HEA website and are presented below. As noted above, the same working definitions were used to evaluate habitat expansion actions during preparation of the Final HEP.

F.2 Working Definitions

This section provides working definitions of the evaluation, selection, and approval criteria found in the HEA. These definitions were developed by the Steering Committee to aid in the process of selecting actions for inclusion in the HEP. The working definitions are meant to complement the HEA definitions and assist in their communication; they are not meant to replace the definitions presented in the HEA.

F.2.1 HEA Evaluation Criteria

This section presents working definitions for the 17 Evaluation Criteria (items a–q contained in Section 4.1.1 of the HEA and in italicized font below). These definitions form the basis for the Steering Committee's application of the Evaluation Criteria to the list of potential actions. Section 4.1.1 states: "The Licensees shall use the following non-exclusive and non-prioritized Evaluation Criteria to screen potential habitat expansion action(s) and develop a preliminary list of viable actions."

(a) favorable feasibility (technically feasible; supported by accepted science; low potential for disease and other risks; proven actions are favored over experimental actions);

Actions/projects should have a high likelihood of success. The type of action should be technically feasible, with a proven track record of results in similar settings. There should be a high degree of scientific support both in terms of the feasibility of the action and its potential contribution to the Habitat Expansion Threshold (HET).

(b) adequate scale of expansion of spawning, rearing and adult holding habitat (one or more larger contiguous gains is favored over numerous smaller gains; increased habitat is favored over enhanced habitat);

The HEP should focus sufficient effort to make measurable and meaningful improvement in habitat for spring-run Chinook salmon. This requires that

projects be designed to solve problems limiting existing habitat potential. Several small, independent projects may not actually solve current problems and hence would provide less benefit than a larger, potentially integrated project that focuses on critical limiting factors. Similarly, the greatest potential for the HEP to make meaningful change may involve focusing projects on a limited number of watersheds (sub-basins of the Sacramento River Basin) rather than spreading projects out across many watersheds.

(c) favorable sustainability of action;

The intent of the HEA is to create "permanent" solutions to problems, or at least to provide benefits through the term of a typical Federal Energy Regulatory Commission license (i.e., up to 50 years). Where possible, projects should address the root cause of current habitat constraints rather than dealing with their symptoms or surface expression, and should consider the potential effects of climate change. Once implemented, projects ideally would be self-sustaining (i.e., requiring a minimum amount of maintenance over the long term). In conjunction with Evaluation Criterion (e), projects providing volitional access for fish to currently unoccupied habitat would likely be considered more sustainable than passage projects requiring high levels of human intervention.

(d) favorable cost-effectiveness and economic feasibility (including consideration of costs necessary to operate and maintain the expansion);

Project funding under the HEA will include capital cost, operations and maintenance (O&M), and project administration. Projects that show efficient use of funds for these cost elements will be favored. One measure of cost effectiveness is the estimated net increase in the population of spawning fish (i.e., the contribution toward the HET) versus the total cost of the action. Projects that include cost sharing, labor sharing, or other measures that allow the HEP to leverage funds, while making meaningful change, would also be favored.

(e) minimal human intervention needed to achieve access to expanded spawning, rearing and adult holding habitat (volitional access is favored over that which requires a high degree of human intervention);

Projects that provide access into habitat currently blocked to anadromous passage will be evaluated relative to the amount of human intervention (e.g., annual maintenance) required. For example, a project that removes a barrier to allow free access (requiring no further maintenance) would be favored over a trap-and-transport project that requires annual collection and transport of fish.

(f) favorable spatial separation from other populations or runs to maintain genetic diversity by minimizing interbreeding;

A priority within the HEA is the segregation of habitat for spring-run and fall-run Chinook salmon (see Section 4.2.3[d]). In the Central Valley, introgression of fall- and spring-run Chinook salmon has been identified as a potential factor limiting spring-run Chinook. In many cases, this is due to the spawning of hatchery-produced fall-run Chinook in areas where spawning of spring-run Chinook occurs. To address this problem, projects that encourage the separation

of fall- and spring-run Chinook will be considered favorable under this criterion. Separation may be achieved either through physical barriers or through the development of habitat conditions that favor spring-run fish over fall-run fish. For example, projects that expand or enhance habitat for spawning in upper portions of a watershed favored by spring-run Chinook would be more desirable than projects enhancing spawning conditions in lower reaches favored by fall-run Chinook. Seasonal flow releases can be used to enhance passage and spawning of spring-run Chinook salmon.

(g) favorable spatial separation from other spawning streams to minimize population impacts of a stream-specific adverse event (geographic distribution is favored over centralization);

A priority within the HEA is the development of a new, geographically separate, self-sustaining population of spring-run Chinook (see Section 4.2.3[c]). NMFS has identified presently viable spring-run Chinook populations in Mill, Deer, and Butte Creeks—a part of the Northern Sierra Nevada diversity group delineated by the Central Valley Technical Recovery Team (Lindley et al. 2007). NMFS recovery efforts call for development of additional viable spring-run populations. In conjunction with Evaluation Criterion (b), a number of projects might need to be concentrated in a single watershed to result in sufficient environmental change to support an additional population.

(h) acceptable length of time to implement (earlier gains are favored over later gains);

Sacramento River spring-run Chinook salmon are in need of immediate assistance to support their recovery. Thus, factors important to the success of a project include not only the length of time to implement the project but also the length of time to realize benefits. Thus, "shovel-ready" projects (i.e., those projects for which implementation can begin within approximately 5 years) will be favored. "Implementation" means initiation of construction after approval of the Final HEP.

The more favorable projects will be those that need minimal additional public process, particularly related to permitting, zoning, or land use issues. In addition, projects that benefit spring-run Chinook within a relatively short period of time (e.g., approximately 10 years or less) will be favored. The environmental and biological benefits of many habitat restoration actions occur only after extended periods. For example, sufficient recovery of riparian forests to address temperature, water quality, and channel needs may require timeframes from decades to centuries to realize. While such projects will not be excluded from consideration, projects that can be implemented sooner and realize benefits within a relatively short period will be preferred.

(i) favorable local/political support;

To provide benefits in the desirable time frame (Evaluation Criterion [h]) and to make best use of available funds (Evaluation Criterion [d]), it is important that HEP projects have public support. Primary stakeholders include affected land owners, management agencies, Resource Conservation Districts (RCDs), and

watershed conservancies. As a project moves through the environmental permitting/design process, crucial support from the stakeholders will be sought. An extended public review process is outside the purview of the HEA. Proposed projects should be vetted with watershed councils; RCDs; and other local, state, and federal agencies. To the maximum extent possible, permitting concerns, land ownership, and required access should be identified in the evaluation of potential actions.

(j) consistency with NMFS Viable Salmonid Population guidance, ESA recovery goals and recovery plan (as available), and expected contribution to species recovery (higher consistency and greater contributions are favored);

The NMFS Viable Salmonid Population (VSP) concept provides direction for characterization of salmonid populations listed under the Endangered Species Act (ESA) (McElhany et al. 2000). The VSP concept underlies most NMFS ESA recovery planning. Elements of VSP thinking are woven throughout the HEA (e.g., Evaluation Criteria [f] and [g]). VSP is also incorporated as part of the HEA conceptual framework. However, VSP does not provide specific criteria for recovery; these are left to recovery planners (e.g., Lindley et al. 2004). Based on VSP and its application to salmon recovery, projects should contribute to the following: (1) abundance, through contribution to the HET; (2) productivity, by increasing the quality of existing and new habitat for spring-run Chinook; (3) biological diversity, by enhancing the breadth of habitat and by discouraging interbreeding of fall- and spring-run Chinook (Evaluation Criterion [f]); and (4) spatial diversity, by promoting development of an additional viable spring-run Chinook population(s) in the Sacramento River Basin (Evaluation Criterion [g]).

(k) balance of benefits to Spring-Run and Steelhead (actions that provide a balance of benefits to both Spring-Run and Steelhead are favored over actions that primarily benefit one species; if multiple actions are undertaken, a combination of actions that provides a balance of benefits to both Spring-run and Steelhead is favored);

The HET provides a numeric habitat goal for spring-run Chinook salmon as the priority species of the HEA and states that "expansion of habitat for spring-run typically accommodates steelhead as well" (see Section 2.2). Spring-run Chinook and steelhead populations often overlap and are found in similar habitats within the same watersheds. Hence, expansion of habitat to meet the HET numeric threshold for spring-run Chinook should also benefit steelhead. While habitat requirements for spring-run Chinook and steelhead are similar, they are not identical. For example, the two species are separated by adult return timing and juvenile and adult life history. However, projects that meet the common habitat requirements of spring-run Chinook and steelhead and contribute to the restoration of both species will be favored.

(l) consistency with other resource uses such as water supply, public safety, flood control, recreation, and power production;

Projects should identify potential conflicts with other uses of the affected watershed and seek to avoid or minimize adverse impacts to other resource uses.

In conjunction with Evaluation Criterion (i), if a potential project is likely to impact other resource uses, there should be demonstrated support for the project from the affected stakeholders (e.g., written documentation of the landowner/water right holder's agreement). Those projects that are most consistent with other resource uses and/or have support from affected stakeholders will be favored.

(m) favorable relative availability of appropriate stocks of Spring-Run and Steelhead for reintroduction;

The purpose of the HEP is to provide habitat for spring-run Chinook salmon and steelhead, with the expectation that fish will expand into new or enhanced habitat. This process of movement of individuals into expanded or enhanced habitat occurs when adult fish stray from their natal areas and spawn in non-natal habitat. Colonization of habitat provided under the HEP will be enhanced in watersheds with some existing remnant populations. Colonization of those watersheds with no spring-run Chinook and/or steelhead, or with no known historical occurrence of these species, would likely be slower without direct intervention (i.e., supplementation from nearby streams with naturally reproducing populations and/or hatcheries). Consequently, projects on streams with remnant populations or with nearby naturally reproducing populations will be favored over those requiring hatchery supplementation.

(n) low expectation for the action to be undertaken by the Licensees or others in the near future;

Projects required as part of other regulatory or legal proceedings are not eligible, as described in Section 3.2 of the HEA. If a project is not likely to be implemented by others within a reasonable period of time (e.g., approximately 5 years), it may be considered. Refer to discussion of Evaluation Criterion (h).

(o) favorable potential to benefit other anadromous, catadromous, and resident fisheries affected by the Feather River Hydroelectric Projects;

Enhancement and expansion of habitat favors a community of co-evolved fish, invertebrate, and plant species. Projects that will provide identifiable benefits to other native fish species, including lamprey, sturgeon, resident trout, hardhead, Sacramento sucker, and pikeminnow, among others, will be favored.

(p) low expectation for adverse impact on listed species and destruction or adverse modification of critical habitat under the ESA (actions with low or no impact are favored); and

The HEA is intended to benefit listed spring-run Chinook salmon and steelhead. Projects should avoid or minimize adverse impacts to other ESA-listed fish, wildlife, amphibian, and plant species.

(q) low potential for an adverse impact on historic or cultural resources.

Projects should avoid or minimize adverse impacts to known historic and pre-historic cultural resources.

F.2.2 HEA Selection Criteria

This section presents working definitions for the four Selection Criteria (items a–d contained in Section 4.1.2 of the HEA and in italicized font below). These definitions form the basis for the Steering Committee's application of the Selection Criteria to the list of Viable Actions. Section 4.1.2 states "After developing a preliminary list of viable habitat expansion action(s) using the Evaluation Criteria set forth in Section 4.1.1 above, the Licensees shall use the following non-prioritized Selection Criteria to select recommended habitat expansion action(s) for implementation:"

(a) contribution to achieving the Habitat Expansion Threshold;

Section 2.2 of the HEA identifies the specific goal "to expand spawning, rearing and adult holding habitat sufficient to accommodate an estimated net increase of 2,000 to 3,000 Spring-run for spawning ("Habitat Expansion Threshold") in the Sacramento River Basin…". Projects may contribute to expanding one or more of these three functional types of habitat, with the final result being achievement of the HET.

Projects are expected to increase the habitat potential for steelhead as well. The contribution of projects to the HET will be defined by the estimated change in equilibrium abundance of spring-run Chinook in the Sacramento River Basin that results from expanding the quantity and quality of habitat available to spring-run Chinook and steelhead. The expansion of habitat potential will be structured to support the development of an additional viable population of spring-run Chinook in the Sacramento River Basin, support the separation of fall and spring runs of Chinook salmon, and be consistent with the Evaluation Criteria in Section 4.1.1.

(b) most cost-effective compared to other potential habitat expansion actions;

For each Viable Action, a rough estimate of its cost and contribution to the HET will be determined. Each Viable Action then will be ranked in terms of its cost effectiveness (i.e., the cost of the action versus its contribution to the HET). Refer to the discussion of favorable cost effectiveness in Evaluation Criterion (d).

(c) feasibility (action[s] can reasonably be accomplished); and

As stated in Evaluation Criterion (a), actions/projects must have a high likelihood of success (i.e., they must be highly feasible). The term "feasibility" is being interpreted broadly to include the concepts described for four Evaluation Criteria: a) technical feasibility, d) economic feasibility, i) favorable political and local support, and (l) consistency with other resource uses.

(d) timing (action[s] can be accomplished in a reasonable period of time).

As noted in Evaluation Criterion (h), factors important to the success of a project include not only the length of time to implement the project but also the length of time to realize benefits. Thus, the HEP will favor "shovel-ready" projects that can be implemented in a reasonable period of time (e.g., less than approximately

5 years). The more favorable projects will be those that need minimal additional public process, particularly related to permitting, zoning, or land use issues. In addition, projects that benefit spring-run Chinook within a relatively short period of time (e.g., approximately 10 years or less) will be favored.

F.2.3 NMFS Approval Criteria

This section presents working definitions for the six NMFS Approval Criteria (items a–f contained in Section 4.2.3 of the HEA). These definitions were considered as part of the Steering Committee's selection process. Section 4.2.3 states: "In determining whether to approve the Final Habitat Expansion Plan, NMFS shall review information submitted by the Licensees, comments by other Parties and directly affected and responsive third parties, and any other relevant information, and consider the extent to which the habitat expansion action(s) recommended in the Plan meet the following Approval Criteria."

(a) estimated to meet the Habitat Expansion Threshold;

As stated in Selection Criterion (a), the proposed projects must expand habitat to support 2,000 to 3,000 spring-run Chinook salmon. It is assumed that the Steering Committee and NMFS will agree on a readily available quantification method to define the contribution of the proposed projects to the HET. Refer to Selection Criterion (a) for further discussion on the HET.

(b) assures necessary testing, operation, and maintenance;

Each proposed project must include a funding mechanism for a period of time equivalent to the life of a typical FERC license (i.e., up to 50 years). The HEP will describe any proposed O&M and other necessary actions, as well as the associated funding mechanism, for a period of 50 years. PG&E and DWR will comply with the requirements of the HEA concerning reporting to the signatories (identified in Section 6.2 of the HEA).

(c) supports establishing a geographically separate, self-sustaining population of Spring-Run;

As discussed in Evaluation Criterion (g), the proposed projects should support development of a viable population of spring-run Chinook salmon within the Sacramento River Basin, in addition to those that already exist in Mill, Deer, and Butte Creeks. The proposed actions need to provide habitat that is of sufficient quantity (e.g., watershed size of 500 km^2 or greater as a guideline) and quality, and sufficiently separate to support a self-sustaining population of spring-run Chinook.

(d) supports segregating Spring-Run habitat from Central Valley fall-run Chinook salmon;

As discussed in Evaluation Criterion (f), the proposed projects should support segregation of spring-run and fall-run Chinook salmon populations. Segregating

the two runs can involve creating a segregation barrier, increasing instream flow, or enhancing habitat for spring-run over fall-run Chinook.

(e) meets the requirements for eligible habitat expansion action(s) pursuant to Section 3 of this Agreement; and

As indicated in Section 3 of the HEA: (1) a variety of action types can fulfill the HEA (e.g., dam removal, dam re-operation, creation or enhancement of fishways, and water temperature/flow improvement); (2) the proposed actions must ensure future O&M and include functional start-up testing as needed; and (3) actions identified in other venues are eligible for consideration provided that what is implemented under the HEA results in an expansion of habitat over any existing requirements and commitments. As stated in Evaluation Criterion (n), projects required as part of other proceedings or with a high likelihood of being implemented within approximately 5 years will not be favored and may be considered ineligible.

(f) expected to be implemented within a reasonable period of time.

Refer to discussion of Evaluation Criterion (h).

F.3 Scoring

The Steering Committee prepared a detailed approach for applying the HEA criteria to potential habitat expansion actions. The Evaluation Criteria were applied to the List of Potential Actions to develop a Ranked Preliminary List of Viable Actions; the Selection Criteria were then applied to the Ranked Preliminary List of Viable Actions to develop a Ranked List of Viable Actions. Based on how they rated against the overall HEA criteria, actions were selected from the Ranked List of Viable Actions to become recommended actions.

The following sections describe the approach that was followed to apply the HEA criteria and develop the various lists of actions, culminating in development of the recommended actions. See Chapter 2 in the Final HEP for additional detail on developing habitat expansion actions.

F.3.1 Applying Evaluation Criteria

Section 4.1.1 of the HEA identifies that "the Licensees shall use the…non-exclusive and non-prioritized Evaluation Criteria to screen potential habitat expansion action(s) and develop a preliminary list of viable actions." Evaluation Criteria scores were applied to the actions in the Short List of Potential Actions to develop a Ranked Preliminary List of Viable Actions (Appendix B4 of the Final HEP). The scoring rationale is described below.

A scale of 1 to 5 was used to score how each action met each of the 17 HEA Evaluation Criteria. No zero values were used in the scoring process. If an action fully met a criterion, it was given a score of 5. If an action failed to meet a

criterion, it was given a score of 1. The intermediate degree to which actions did or did not meet a criterion determined a score of 2, 3, or 4.

(a) Feasibility – The primary components of this criterion were technical feasibility, support by accepted science, and proven methodology (i.e., not experimental). If an action met the three primary components of criterion (a), it was given a score of 5; if one or two of the components were not met, the action scored a 3; if none of the three components was met, the action scored a 1.

(b) Scale – The primary components of this criterion are the estimated contribution to the HET, representing amount of habitat gain; benefits provided to the three habitat types identified in the goal of the HEA (i.e., spawning, rearing, and adult holding habitat); and the type of habitat expansion (i.e., increase in habitat versus enhancement of existing habitat). Actions resulting in a large gain of potential spawners, an increase in habitat, and benefits to all three habitat types received a score of 5; actions resulting in a moderate gain of potential spawners and addressing at least one habitat type either through increased or enhanced habitat received a score of 3; actions with a low gain of potential spawners and poor habitat quality received a score of 1.

(c) Sustainability – The lifespan and the degree to which an action was self-sustaining (i.e., requiring a minimum amount of maintenance) are the primary components of this criterion. Actions that provided a solution with a long lifespan and minimal maintenance throughout the lifespan of the action received a score of 5; actions that provided limited-term solutions, required annual maintenance, and/or relied on long-term agreements received a score of 3; actions with a short lifespan and requiring a high degree of maintenance received a score of 1.

(d) Cost Effectiveness – The estimated net increase in the population related to the total cost of the action and annual operations and maintenance (O&M) costs are the primary components of this criterion. Actions estimated to have low capital and O&M costs along with an estimated moderate to high contribution to the HET received a score of 5; actions with moderate capital and/or O&M costs and with a low to moderate contribution to the HET received a score of 3; actions with high capital and high O&M costs that outweigh the potential contribution to the HET received a score of 1.

(e) Minimal Human Intervention – Actions were scored based on the level of human intervention required for habitat expansion during the lifespan of the action. Self-sustaining actions that required no maintenance received a score of 5; actions that required minimal to moderate annual O&M and no handling of fish received a score of 3; actions that required intensive handling of fish along with high O&M received a score of 1.

(f) Separation (Genetic) – The actions were scored based on the degree to which they would provide for the spatial segregation of fall-run and spring-run Chinook salmon. Actions that would provide spatial separation between fall-run and spring-run Chinook salmon either by volitional passage into the upper watershed or by a physical barrier received a score of 5; actions that

would promote spatial separation by addressing spring-run Chinook salmon life history strategies (e.g., springtime flows) received a score of 3; actions that would not provide or promote spatial separation received a score of 1.

(g) Separation (Catastrophe) – The actions were scored based on the degree to which they would provide for protection against catastrophic events (e.g., volcanic eruption or wildfire) potentially impacting existing independent, self-sustaining spring-run Chinook salmon populations in Mill, Deer, and Butte Creeks. If an action is within a watershed that is outside the predicted range of large-scale catastrophic events (e.g., eruption of Mt. Lassen or Mt. Shasta), it received a score of 5; if an action is within a watershed that is in the range of a smaller-scale catastrophic event (e.g., wildfire) it received a score of 3; if an action is within a watershed supporting an independent, self-sustaining population (i.e., Mill, Deer, or Butte Creek) it received a score of 1.

(h) Time to Implement – If the action could begin implementation (i.e., receive permits and break ground) within approximately 5 years, it received a score of 5; if the action could begin implementation within approximately 5 to 10 years, it received a score of 3; if an action would likely take more than 10 years to begin implementation, it received a score of 1.

(i) Local/Political Support – If support for an action was anticipated from all HEA signatories and local stakeholders, it received a score of 5; if the action had some support but also some known opposition from either HEA signatories or local stakeholders, it received a score of 3; if an action had substantial opposition and little or no support from HEA signatories or local stakeholders, it received a score of 1.

(j) VSP/ESA Consistency – The actions were scored based on the degree to which they were consistent with the VSP concept. Because there are four components to the VSP concept (i.e., abundance, productivity, biological diversity, and spatial structure), actions anticipated to contribute to all four components were given a score of 5, contribution to three components was given a score of 4, contribution to two components was given a score of 3, and contribution to one component was given a score of 2. If an action was not anticipated to contribute to any of the VSP components, it was given a score of 1.

(k) Balance of Benefits – If an action was anticipated to result in equal benefits to both spring-run Chinook salmon and steelhead, it received a score of 5; actions with moderately more benefits to spring-run Chinook salmon than steelhead received a score of 3; actions specifically targeting spring-run Chinook salmon and providing no benefit to steelhead received a score of 1.

(l) Resource Consistency –There are five primary components to this criterion: water supply, public safety, flood control, recreation, and power production. Actions that would not negatively affect any of these components received a score of 5. For each component the action could adversely affect, the score was reduced by 1.

(m) Available Stocks – If an action would occur in a watershed with an independent, self-sustaining population, it received a score of 5; actions in

watersheds with extant, remnant populations received a score of 4; actions in watersheds where a population could be re-established via straying from a nearby watershed received a score of 3; actions in watersheds where a population could be re-established via straying from more distant streams, increasing time to realize benefits, received a score of 2; actions in watersheds where the population would need to be re-established by inter-basin transfer of fish received a score of 1.

(n) Actions Taken by Others – Actions that were not likely to be taken by others within the foreseeable future (i.e., approximately 5 years) received a score of 5; actions with potential to be taken by others within the foreseeable future received a score of 3; actions likely to be taken by others within the foreseeable future received a score of 1. Actions taken by others could include actions taken by the Licensees in other forums outside of the HEA.

(o) Benefit to Other Feather River Species – Actions that would provide identifiable benefits to the entire community of fishes native to the Feather River received a score of 5; actions that would provide benefits to some of the native fishes received a score of 3; those that would provide benefits to only spring-run Chinook salmon and steelhead received a score of 1.

(p) Adverse Effects (Listed Species) – If an action was not expected to adversely affect listed species or their critical habitat, it received a score of 5. If an action could result in minimal impacts that could be mitigated, it received a score of 3. If an action could cause impacts that could not be mitigated, it received a score of 1.

(q) Adverse Effects (Cultural) – If an action was not expected to adversely affect historic or cultural resources, it received a score of 5. If an action could result in minimal impacts that could be mitigated, it received a score of 3. If an action could cause impacts that could not be mitigated, it received a score of 1.

Scoring the Short List of Potential Actions by the Evaluation Criteria resulted in the Ranked Preliminary List of Viable Actions found in Appendix B4 of the Final HEP.

F.3.2 Applying Selection Criteria

Section 4.1.2 of the HEA explains that "[a]fter developing a preliminary list of viable habitat expansion action(s) using the Evaluation Criteria set forth in Section 4.1.1…, the Licensees shall use the…non-prioritized Selection Criteria to select recommended habitat expansion action(s) for implementation." After the Evaluation Criteria were applied, the Ranked Preliminary List of Viable Actions was reevaluated. Some actions were removed because the actions were (1) already completed; (2) addressed in other actions on the list; (3) not viable; or (4) not eligible under Section 3.2 of the HEA. Selection Criteria scores were applied to the remaining actions, resulting in the Ranked List of Viable Actions (Appendix B5 of the Final HEP). The scoring rationale is described below.

Consistent with the methodology used for the Evaluation Criteria, a scale of 1 to 5 was used to score how well each action met each of the Selection Criteria. No zero values were used in the scoring process.

(a) Contribution to the HET – The procedure described in Chapter 3 of the Final HEP was used to estimate how many additional fish the area of the watershed might support for each action or group of actions. Because a number of assumptions were made to arrive at the estimates, the contribution to the HET for a particular action or group of actions was assigned a score of 1, 3, or 5 based on the estimate. A score of 1 was used for those actions that would not meet the HET, a score of 3 was used for those actions that would meet the HET, and a score of 5 was used for those actions that would exceed the HET. Scores were assigned to all of the actions or groups of actions on the Ranked Preliminary List of Viable Actions.

(b) Cost effectiveness compared to other actions on the Ranked Preliminary List of Viable Actions – The actions were assessed based on a relationship between cost and contribution to the HET, consistent with the working definitions of the HEA criteria (Section G.2). Cost effectiveness was assigned a score of 1, 3, or 5 based on how cost effective the action or group of actions was compared to the others on the Ranked Preliminary List of Viable Actions. The total estimated cost of each action or group of actions was divided by the estimated contribution to the HET in order to calculate an estimated cost-per-fish. The estimated cost-per-fish for each action or group of actions was then divided by the highest cost-per-fish action. This approach enabled a comparison of the cost effectiveness of the actions on the Ranked Preliminary List of Viable Actions. Scores were assigned to the actions based on resulting values. A score of 1 was assigned to the actions that fell in the highest 10% (most expensive per fish) of all the actions, a score of 3 was assigned to the actions that fell in the middle of the range, and a score of 5 was assigned to the actions that fell in the lowest 10% (least expensive per fish).

(c) Feasibility – Feasibility was based on four of the Evaluation Criteria: (a) feasibility; (d) cost-effectiveness; (i) local/political support; and (l) resource consistency. The scores of these four Evaluation Criteria were combined to develop a single feasibility score for each action or group of actions. Specifically, an average of the four Evaluation Criteria scores was used to determine the feasibility score for the actions.

(d) Timing – The Evaluation Criterion (h) time to implement, score was used to score the timing for the Selection Criteria as well.

The scores resulting from application of the four Selection Criteria were added to yield a total score. The next step was to combine the scores from the Selection Criteria with the scores from the Evaluation Criteria in order to identify which actions best met these two elements of the HEA. This was achieved by weighting the Evaluation Criteria. The Evaluation Criteria weighting was determined by dividing the "Total Score" for each action or group of actions from the Ranked Preliminary List of Viable Actions by the highest total score. Scores from the Selection Criteria were then multiplied by these weights, thereby

utilizing the Evaluation Criteria scores while not diminishing the importance of the Selection Criteria. The resultant scores were normalized.

The results of scoring the Ranked List of Viable Actions by the Selection Criteria are found in Appendix B5 of the Final HEP.

F.4 Scoring the Upper Yuba River and Lower Yuba River Actions

Following release of the Draft HEP, NMFS submitted a completed HEA questionnaire for the Upper Yuba River. NMFS requested that the Licensees re-evaluate the Upper Yuba River Actions in the Final HEP (see Chapter 2 in the Final HEP). In addition, the Licensees modified the components recommended in the Lower Yuba River Actions (see Chapters 2 and 4 in the Final HEP). Consequently, both actions required re-evaluation and re-scoring for the Final HEP. The Steering Committee used the same working definitions and scoring process developed for the Draft HEP to re-evaluate the Lower Yuba River Actions and the Upper Yuba River Actions in the Final HEP.

Table F-1 presents the scores for the Upper and Lower Yuba River Actions that were developed for the Final HEP. For comparative purposes, scores for the Upper Yuba River Actions that were included in the Draft HEP and those that were provided by NMFS in their comment letter on the Draft HEP also are included in Table F-1.

F.5 References

Lindley, S. T. and others. 2004. Population structure of threatened and endangered Chinook salmon ESUs in California's Central Valley Basin. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. (NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-360.) 56 pages.

Lindley, S. T. and others. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science [online serial] Volume 5, Issue 1, Article 4.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionary significant units. U.S. Department of Commerce. (NOAA Technical Memorandum NMFS-NWFSC-42.) 156 pages.

Table F-1. Scoring of the Upper and Lower Yuba River Habitat Expansion Actions

Upper Yuba River Actions[a]					Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
Evaluation Criteria						
(a) Feasibility	2	5	2	Each of the three components of this criterion (technical feasibility, support by accepted science, and proven methodology) would be only partially met by these actions. Multiple issues limit feasibility (e.g., uncontrolled flows on the North Yuba River would complicate juvenile collection, and there are accessibility issues for potential juvenile collection sites). Full-blown trap-and-transport operations have had limited application and success in situations similar to this one. Given these issues, a score of 2 is warranted.	5	These actions meet all three components of the criterion: technical feasibility, support by accepted science, and proven methodology. Fulfilling all three components of this criterion results in a score of 5.
(b) Scale	4	5	5	These actions would meet/exceed the HET (thus resulting in a large gain of potential spawners), expand spawning habitat in the upper North Yuba River, and benefit all three habitat types; thus, it fulfills all three components of this criterion. Also, given the length of available stream and the size of the project compared to other actions assessed, it warrants a score of 5.	4	These actions would meet the HET, thus resulting in a large gain of potential spawners; expand spawning habitat in the Lower Yuba River at Sinoro Bar and Narrows Gateway; and benefit spawning and holding habitat types. Providing a large gain in potential spawners and fulfilling two components of this criterion results in a score of 4.
(c) Sustainability	2	4	3	These actions have a moderate to long lifespan, but substantial operations and maintenance (O&M) (annual trap-and-transport operations) would be required to sustain it. Given this balance, a mid-range score of 3 is reasonable.	4	The sustainability of these actions is projected to be high over the approximately 50-year term (Pasternack pers. comm.). However, the likely need for periodic maintenance of the spawning beds and potential O&M activities for the segregation weir lowers the score to 4.

Table F-1. Continued

Upper Yuba River Actions[a]					Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
(d) Cost Effectiveness	1	4	1	If considered simply to fulfill the HEA, these actions would involve the transport of only enough fish to satisfy the HET. The capital cost of constructing the facilities to collect and transport fish is estimated to be $80 million. Annual operation and maintenance costs would also have to be provided for an approximately 50-year period. Thus, a trap-and-transport action to support 2,000−3,000 spring-run Chinook salmon would be expensive and warrants a score of 1.	4	These actions would meet the HET (habitat for 2,000−3,000 spring-run Chinook salmon), while combined capital and O&M costs would be $23.4 million. Thus, a score of 4 is warranted.
(e) Minimal Human Intervention	1	1	1	Trap-and-transport operations require intensive handling of both upstream migrating adults and downstream migrating smolts. Of all of the types of habitat expansion actions available, trap and transport requires the greatest amount of human intervention warranting a score of 1.	3	Once implemented, these actions would support the natural behavior of spring-run and steelhead. Intervention (installation of a segregation weir) would be required only in the event that inadequate segregation between spring-run and fall-run Chinook salmon occurs. A mid-range score of 3 is appropriate.
(f) Favorable Spatial Separation (Run Timing)	5	5	5	By transporting adult spring-run Chinook salmon to the North Yuba River above New Bullards Bar Reservoir and leaving fall-run fish to spawn in the Lower Yuba River, clear separation between the runs would be achieved, resulting in a score of 5.	3	Separation between spring-run and fall-run Chinook salmon using the segregation weir would receive a 5 (physical barrier provided). However, without implementation of the optional segregation weir, the remaining actions would receive a score of 3 (promote separation by providing expanded habitat favored by spring-run Chinook salmon).
(g) Favorable Spatial Separation (Catastrophe)	5	5	5	The North Yuba River is beyond the predicted range of catastrophic events; thus, these actions receive a score of 5.	5	The Lower Yuba River is beyond the predicted range of catastrophic events; thus, these actions receive a score of 5.

Table F-1. Continued

Upper Yuba River Actions[a]					Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
(h) Time to Implement	2	3	2	These actions are likely to take 10 years or more to reach the implementation stage for the following reasons: (1) they are in the very informative stages of development; (2) multiple parties need to come together and agree upon actions and responsibilities; and (3) many technical issues need to be resolved. A similarly scaled project in the Battle Creek watershed has taken well over 10 years to reach implementation. An estimated 10-year timeframe for implementation of these actions yields a score of 2.	5	Implementation of these actions could likely begin within approximately 5 years, warranting a score of 5.
(i) Local and Political Support	3	4	3	Initial meetings of the Yuba River Multi-Party Forum (now the Yuba Salmon Forum) to discuss these and related actions in the Upper Yuba River watershed indicate a mixture of support and opposition among the watershed stakeholders for this type of project, thus warranting a mid-range score of 3. The Steering Committee met with Yuba County Water Agency (YCWA) on August 17, 2010, to explore possible partnering opportunities related to the Upper Yuba River Actions. None have been identified.	3	These actions are widely supported for their expansion/enhancement benefits for anadromous salmonids in the Lower Yuba River. In the event that these actions are approved for implementation under the HEA, they would be well supported. Lack of concensus among all the signatories to the HEA, however, warranted a lower, mid-range score of 3.

Table F-1. Continued

	Upper Yuba River Actions[a]				Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
(j) VSP/ESA Consistency	4	5	4	Overall, these actions support the four viable salmonid populations (VSP) components (abundance, productivity, biological diversity, and spatial structure); however, there are likely issues with productivity. While trying to provide for a "wild" population, some negative impacts would be associated with the inefficiencies and stress associated with trap-and-transport operations. These impacts would limit productivity, warranting a score of 4.	5	Given the expansion of habitat and the option of installing a segregation weir to facilitate segregation between fall-run and spring-run Chinook salmon, these actions would contribute to all four VSP components (abundance, productivity, biological diversity, and spatial structure) and thus warrant a score of 5.
(k) Balance of Benefits	5	5	5	If trap-and-transport actions were implemented for spring-run Chinook salmon, operations could ultimately include steelhead. Thus, there is potential for balanced benefits for both species, warranting a score of 5.	4	The benefits of these actions would largely be to spring-run Chinook salmon, with ancillary benefits to steelhead. Benefits to steelhead could be significant, but they are likely to be less than for spring-run Chinook salmon, thus warranting a score of 4.
(l) Resource Consistency	3	4	4	Of the five components of this criterion, only recreation holds the potential of being adversely affected, warranting a score of 4. Angling could be restricted in the North Yuba River to protect introduced salmon, and boating could be obstructed by the juvenile collection facilities.	4	Of the five components of this criterion, only recreation has the potential to be adversely affected, warranting a score of 4. Angling opportunities could be reduced if additional regulations were enacted to protect areas rehabilitated under the HEP, and boating could be seasonally obstructed if a weir was installed.
(m) Available Stocks	4	4	3	Spring-run Chinook salmon stocks available for reintroduction would likely be coming from the Feather River Hatchery or the Lower Yuba River, which appears to be predominated by hatchery strays. In either scenario, the dependency on hatchery fish warrants a score of 3.	3	Recent data indicate that spring-run Chinook salmon returns in the Lower Yuba River are dominated by straying fish from the Feather River Hatchery, warranting a score of 3.

Table F-1. Continued

Upper Yuba River Actions[a]					Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
(n) Actions Taken by Others	4	5	5	Despite these and other related actions being addressed as part of the Yuba Salmon Forum, it is highly unlikely that other parties would undertake these actions in the near term (i.e., within approximately 5 years). Thus, a score of 5 is reasonable.	4	Efforts are ongoing by the South Yuba River Citizens League to develop potential off-channel rearing habitat in the Lower Yuba River. The score for this criterion therefore should drop to 4, because some recommended actions for off-channel rearing habitat may be partially included in other efforts.
(o) Benefit to Other Feather River Species	1	1	1	Benefits to Feather River fish species other than spring-run Chinook salmon and steelhead are highly unlikely, warranting a score of 1. Ecological benefits could result from nutrient enhancement in the North Yuba River. However, considering 2,000─3,000 carcasses over 35 miles of river, no appreciable benefit would be likely.	3	Other native Feather River fishes would benefit based on similar spawning substrate requirements and the volitional nature of passage into the created habitat. However, given the lack of data regarding habitat use of non-salmonids in the Lower Yuba River, a score of 3 is reasonable.
(p) Adverse Effects on Other ESA Species	4	5	5	It is unlikely that there are any listed species in the upper watershed that would be affected by these actions. Thus, a score of 5 is warranted.	5	Based on the U.S. Fish and Wildlife Service special species list prepared for the *Lower Yuba River Gravel Augmentation Project Yuba and Nevada Counties, California Draft Environmental Assessment* (September 2010), no listed species in the Lower Yuba River would be affected by these actions. Thus, a score of 5 is warranted.
(q) Adverse Effects on Cultural Resources	5	5	5	It is unlikely that these actions would adversely affect any cultural resources. Thus, a score of 5 is warranted.	5	It is unlikely that these actions would adversely affect any cultural resources. Thus, a score of 5 is warranted.
Total Score	**55**	**70**	**59**		**69**	

Table F-1. Continued

Upper Yuba River Actions[a]					Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
Selection Criteria						
(a) Contribution to the HET	1	5	3	A trap-and-transport program on the North Yuba River has the potential to provide access to habitat that would accommodate more than 3,000 spring-run Chinook salmon. However, such a program under the HEA would need to specify transport of fish sufficient to meet the HET, as there is no obligation to exceed the HET. There is the potential to partner with others to increase the number of fish transported. Likely partners would be the U.S. Army Corps of Engineers or YCWA, or perhaps a consortium of stakeholders. At present, there is no obligation, commitment, or consensus of the likely partners. This may be achieved through the Yuba River Salmon Forum currently being formed but not within the expected timeline of the HEA. Thus, under the HEA, these actions would meet the HET and receive a mid-range score of 3.	4	These actions are likely to exceed the HET, but the degree to which they would exceed the HET is uncertain. Therefore, a score of 4 is appropriate.
(b) Cost Effectiveness	3	3	1	Compared to other actions evaluated, trap-and-transport actions, including the Upper Yuba River Actions, are the most expensive on a cost-per-fish basis because of the necessary infrastructure and O&M costs required to sustain the program. Thus, a score of 1 is warranted.	5	Compared to other actions evaluated, the Lower Yuba River Actions are the more cost effective on a cost-per-fish basis, warranting a score of 5.
(c) Feasibility	2	5	3	The average of the four Evaluation Criteria that comprise this Selection Criterion—(a) feasibility, (d) cost effectiveness, (i) local/political support, and (l) resource consistency—is 2.5. Rounding up this value yields a score of 3 for this criterion.	4	The average of the four Evaluation Criteria that comprise this Selection Criterion—(a) feasibility, (d) cost effectiveness, (i) local/political support, and (l) resource consistency—is 4.

Table F-1. Continued

Upper Yuba River Actions[a]					Lower Yuba River Actions[b]	
Criterion	**Draft HEP Score**	**NMFS Score**	**Final HEP Score**	**Rationale**	**Final HEP Score**	**Rationale**
(d) Time to Implement	2	3	2	As stated for Evaluation Criterion (h), time to implement, these actions likely would require 10 or more years to reach the implementation stage; thus, a score of 2 is warranted.	5	As stated for Evaluation Criterion (h), time to implement, implementation of these actions likely could begin within approximately 5 years. Thus, a score of 5 is warranted.
Total Score	**8**	**16**	**9**		**17**	

Notes:

HEA = Habitat Expansion Agreement for Central Valley Spring-run Chinook Salmon and California Central Valley Steelhead.
HEP = Habitat Expansion Plan.
HET = Habitat Expansion Threshold.
NMFS = National Marine Fisheries Service.

[a] Reintroduction of spring-run Chinook salmon into the North Yuba River above New Bullards Bar Reservoir.

[b] Spawning habitat expansion at Sinoro Bar and Narrows Gateway and installation of an optional segregation weir, if deemed necessary by the resource agencies (NMFS, U.S. Fish and Wildlife Service, and California Department of Fish and Game).